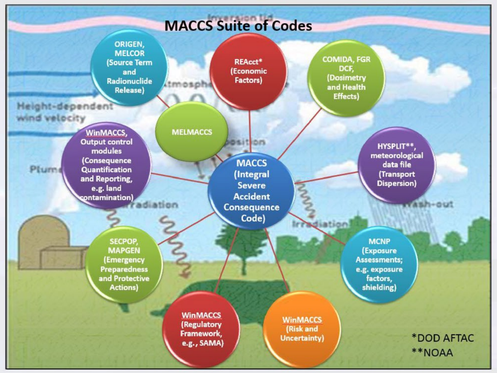
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

RIC 2016

MELCOR Accident Consequence Code System Development



MELCOR ACCIDENT CONSEQUENCE CODE SYSTEM SUITE OF CODES

MACCS is a severe accident consequence computer code developed to analyze the offsite consequences of a hypothetical release of radioactive material. The code models atmospheric transport and deposition, weather variability, dose pathways, emergency response, and long-term economic and health impacts.

WinMACCS

- Facilitates the routine use of MACCS and the evaluation of uncertainties.
- Allows for modeling network evacuation using simulated road network for more realistic modeling of protective actions.

MelMACCS

- Preprocessor code that provides an interface between MELCOR and MACCS to extract and evaluate the required source term data for a consequence analysis.

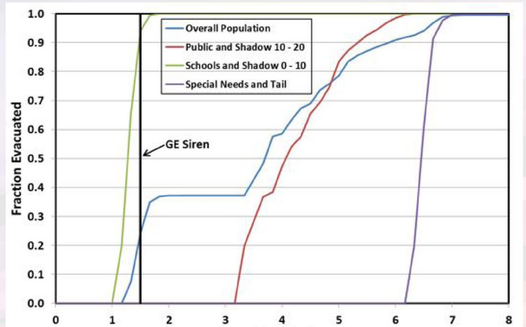
SecPop

- Code that generates site data by accessing population, land use, and economic value databases and uses algorithms to map the data onto a user-defined computational grid.

Other Code Utilities

- COMIDA2 for the food-chain pathway
- Latin Hypercube Sampling (LHS) to sample uncertain inputs
- Combine Source to perform multi-unit consequence analyses

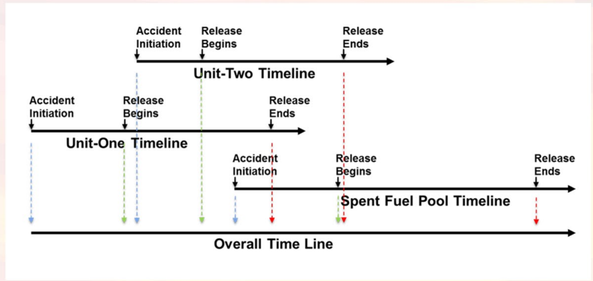
RECENT CODE DEVELOPMENT



Fraction of Population Exiting Emergency Planning Zones for Example Long-Term Station Blackout Scenario

Tracking Population Movement

- The timing of evacuating cohorts crossing boundaries can be evaluated to verify consistency with the evacuation time estimate.



Multi-Source Releases

- Allows releases from multiple units with independent accident initiation times, release timelines, and isotopic inventories.
- Support for multi-unit source terms and multi-ring spent fuel pool source terms.

Parameter Modifications for Early Phase

- Modified parameter upper bounds to allow for emergency phases lasting longer than 1 week.

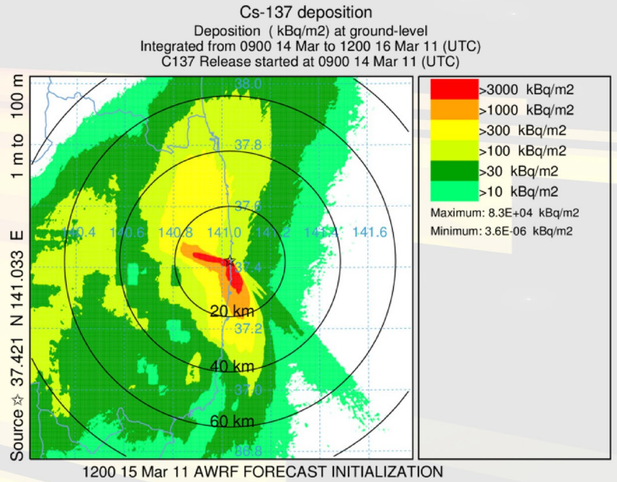
ONGOING CODE DEVELOPMENT

New Optional Atmospheric Transport Model

- Integration of HYSPLIT (from National Oceanic and Atmospheric Administration) with MACCS.

Alternative Economic Consequences Model

- Estimates the offsite cost impact from business disruption using current state-of-practice economics based on gross domestic product.
- Considers the impact on the local and regional communities, industries, and infrastructure.
- Considers indirect effects on the national economy outside the directly affected region.



HYSPLIT Model of Cs-137 Deposition from Early Release Data